HYPER 66DH

MAINTENANCE, OPERATING AND SERVICE MANUAL

DHD360

Geothermal Water Well

ISOQAR REGISTERED

UKAS MANAGEMENT SYSTEMS 0026

Certificate No. 2448/00

Bulroc
U.K. Ltd
HYPER 66
Manufacturers of Rock Drilling Equipment
DH
SERIES

Go drill it.

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INTRODUCTION 1

The Bulroc Hyper 66DH is a strong, robust valveless DTH hammer of a simple and straightforward design to provide maximum performance with a minimum of maintenance.

The Hyper 66DH is specifically designed to operate efficiently at air pressures between 10bar (150psi) and 30 bar (430psi) and to operate efficiently at depths, overcoming high heads of water. The combined control tube, diverter and check valve minimises the number of component parts, reducing the overall length of the hammer for ease of handling.

The Hyper 66DH is supplied as standard with a check valve arrangement that is designed to help maintain pressure inside the hammer when the air is turned off for rod changing and so prevent contaminated water from entering the hammer. The standard backhead connection on the Hyper 66DH is 3½" API reg pin.

The Hyper 66DH hammer is designed to give optimum performance with minimum air consumption and is fitted as standard with a Solid Air Choke. However, for particularly deep holes or excessively high inflows of water, a selection of chokes are supplied with each hammer.

The Choke Plug can be completely removed if necessary giving a through hole size of 1/4" / 6.3mm.

Geothermal

Water Well

ALWAYS THINK SAFETY FIRST!

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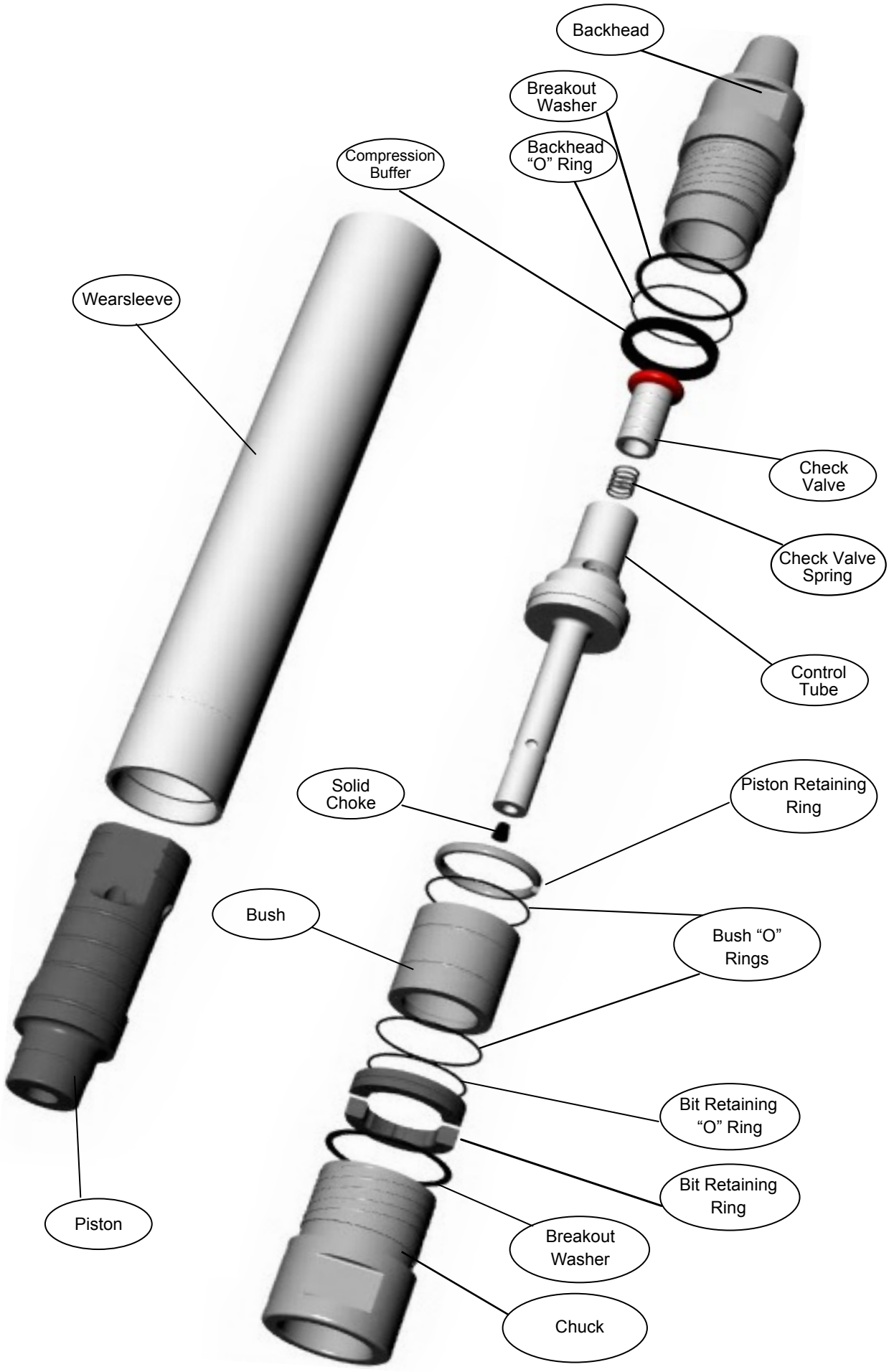
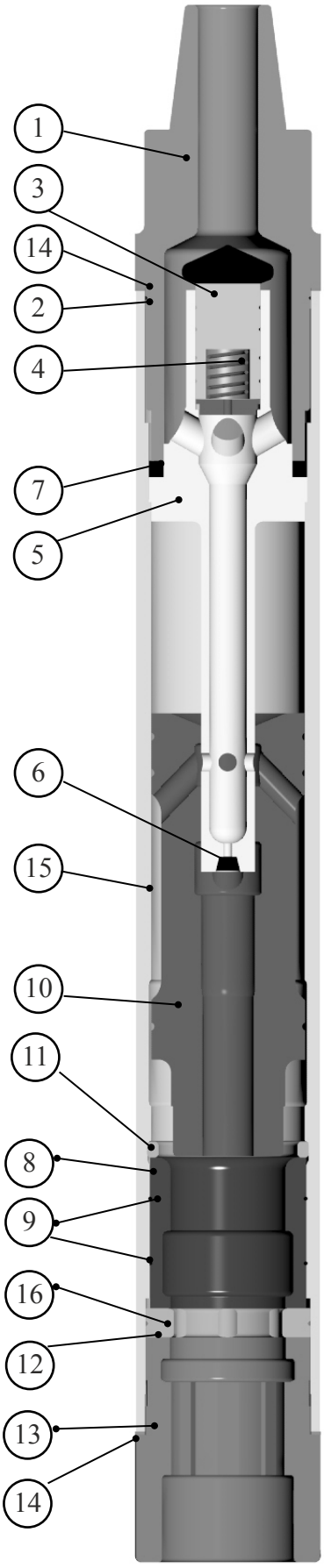
2 COMPONENTS



PARTS LIST 3

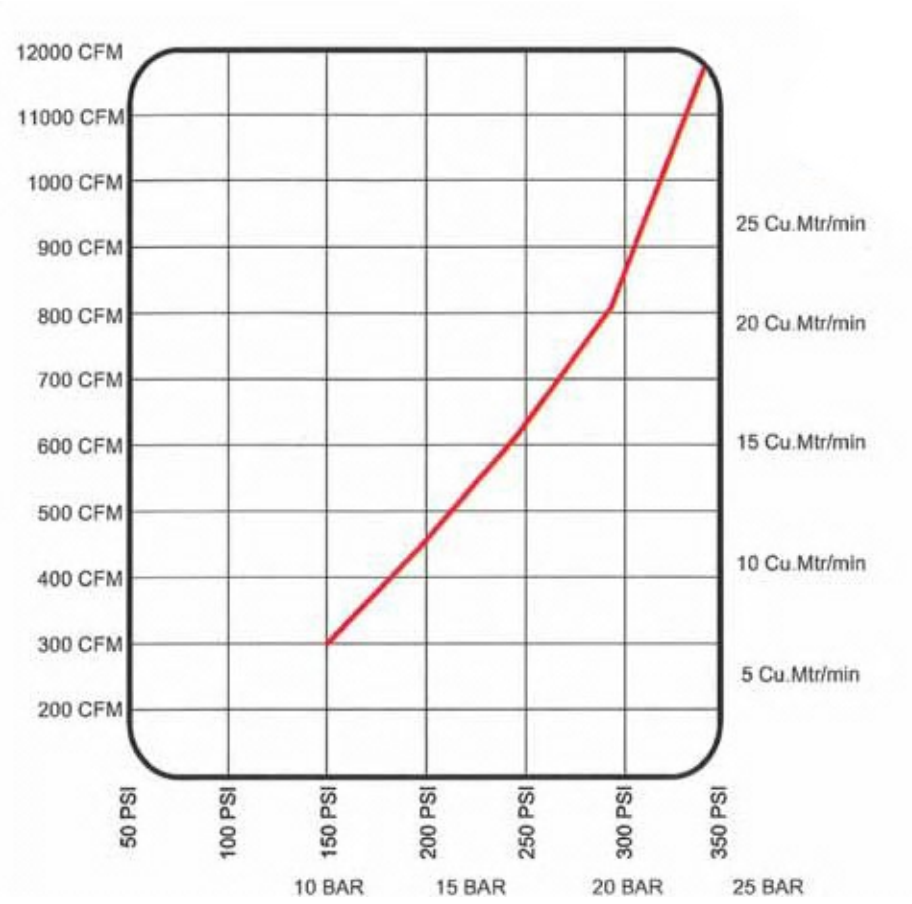


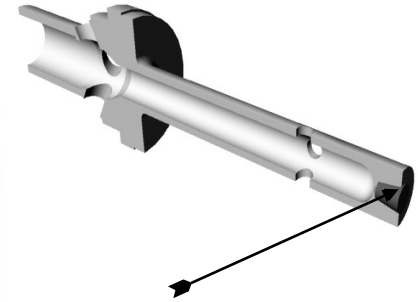
Ref	Description	Part Number	Qty
1	Backhead	HSH66DH3803M	1
2	Backhead ‘O’ Ring	HSH6114	1
3	Check Valve	IPRCV04	1
4	Check Valve Spring	IPRCVS04	1
5	Control Tube	HSH66DH30	1
6	Choke Set & allan key	HSH66DH19	1
7	Compression Buffer	HSH66DH22	1
8	Bush	HSH66DH86	1
9	Bush “O” Ring	HSH66DH87	1
10	Piston	HSH66DH03	1
11	Piston Retaining Ring	HSH6132	1
12	Bit Retaining Ring	HSH66DH37093	1
13	Chuck	HSH66DH35093	1
14	Breakout Washer	HSH66DH26	1
15	Wearsleeve	HSH66DH0093	1
16	Bit Retaining ‘O’ Ring	HSH66DH37A093	
	QUICK ORDER CODES		
	Complete Hammer	BR66DH01	

SPECIFICATIONS

	Imperial	Metric
Weight (less bit)	219 lbs	100 Kgs
Length (less bit)	43.03"	1093 mm
Outside dia.	5.620"	142.75 mm
Piston weight	43.5 lbs	20 Kg
Stroke	4.25"	108 mm

AIR CONSUMPTION 5





Solid Choke Plug fitted as standard

Additional Flushing

A solid choke is fitted at the end of the control tube. In certain drilling conditions, extra flushing air may be required to overcome increased back pressure and to maintain sufficient up hole velocity to ensure efficient hole cleaning.

In such conditions, the solid choke plug can be replaced with an open hole choke of a particular size or can be removed completely to give the maximum amount of additional live flushing air, depending on the operating pressure.

The top two tables show the extra flushing air that can be passed through each choke at different pressures. The bottom two tables show the total air required for the Hyper 66DH hammer with different chokes and at different operating pressures.

Extra flushing air for a choke in cubic feet per min							
Hole Size	150 psi	200 psi	250 psi	300 psi	350 psi	400 psi	430 psi
0.063”	9.5	12.4	15.2	18.1	21	23.8	25.5
0.125”	37.5	49	60.3	71.8	83.2	94.5	101.3
0.188	75	98	120.6	143.6	166.2	189	202.6
0.250”	150	196	241.2	287.2	332.8	378	405.2

Extra flushing air for a choke in cubic metres per min							
Hole Size	10.3 bar	13.8 bar	17.2 bar	20.7 bar	24.1 bar	27.6 bar	29.7 bar
1.60 mm	0.27	0.35	0.43	0.51	0.59	0.67	0.72
3.20 mm	1.06	1.39	1.71	2.03	2.36	2.68	2.67
4.75 mm	2.12	2.78	3.42	4.07	4.71	5.35	5.74
6.30 mm	4.25	5.55	6.83	8.13	9.42	10.7	11.47

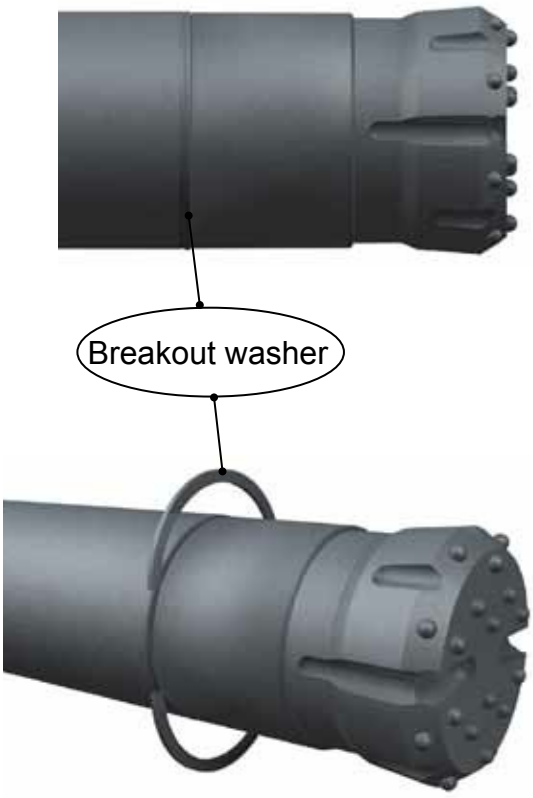
Total air requirements for a choke in cubic feet per min							
Choke Size	150 psi	200 psi	250 psi	300 psi	350 psi	400 psi	430 psi
blank	296.3	456.2	637.5	838	1056	1290.2	1439.8
0.063”	305.8	468.6	652.7	856.1	1077	1314	1465.3
0.125”	333.8	505.2	697.8	909.8	1139.2	1384.7	1541.1
0.188”	371.3	554.2	758.1	981.6	1222.2	1479.2	1642.4
0.250”	446.3	652.2	878.7	1125.2	1388.8	1668.2	1845

Total air requirements for a choke in cubic metres per min							
Choke Size	150 psi	200 psi	250 psi	300 psi	350 psi	400 psi	430 psi
blank	8.39	12.92	18.05	23.74	29.9	36.53	40.77
1.60 mm	8.66	13.27	18.48	24.24	30.5	37.21	41.49
3.20 mm	9.45	14.31	19.76	25.76	32.26	39.21	43.64
4.75 mm	10.51	15.69	21.47	27.8	34.61	41.89	46.51
6.30 mm	12.64	18.47	24.88	31.86	39.33	47.24	52.24

STRIPPING THE HAMMER

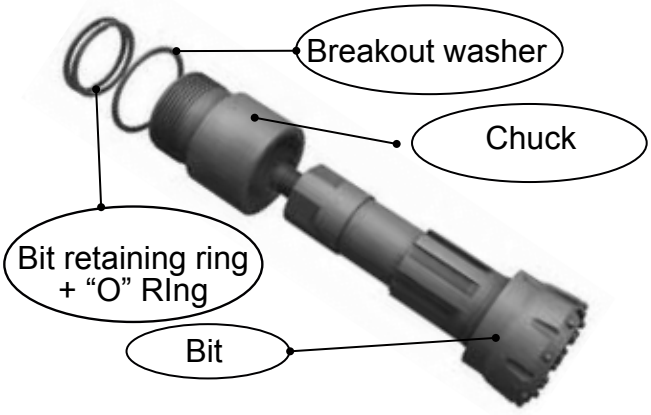
After extensive drilling, the chuck and the back head might become too difficult to loosen on a Hammer Bench Splitter or the drill rig. In such conditions the breakout washer can be ground or drilled which will relieve the pressure and enable the chuck to be removed.

(NB. On no account should the wearsleeve be impacted by a hammer. Splitting should never be assisted by the use of localised heat, ie. Blow torch. Any signs of hammer indentations or applied heat will void the warranty.)



Assuming now both the backhead and chuck threads have been loosened either on the drill rig or a Hammer Splitter, the stripping operation is as follows.

1.Remove the chuck assembly.

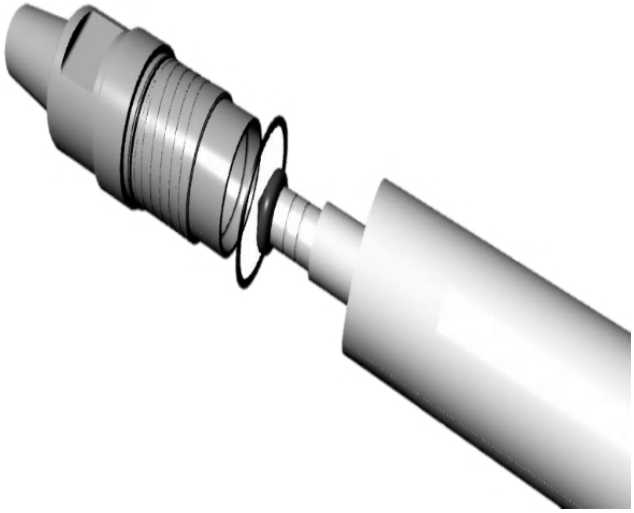


2.Removing the ‘O’ ring from the bit retaining ring will allow the bit to be removed. Alternatively pulling the two pieces apart will allow the ‘O’ ring to stretch enough to fit over the end of the bit shank.

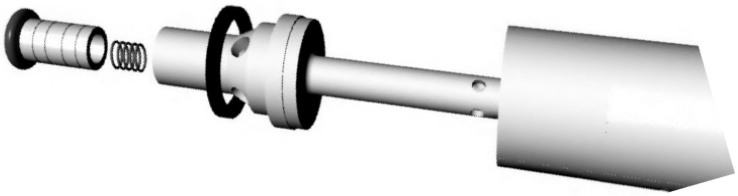
3.The bit can now be removed from the chuck quite easily.

STRIPPING THE HAMMER 7

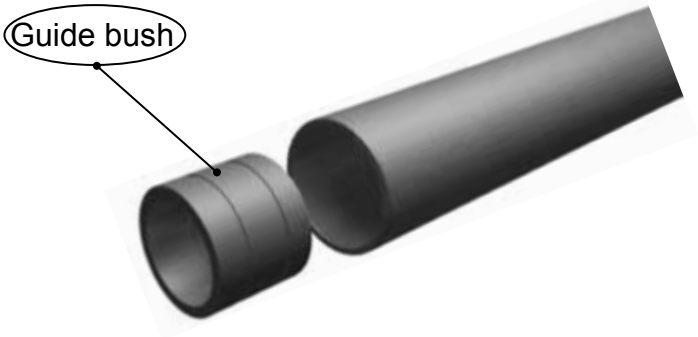
4.With the hammer laid horizontal, unscrew the backhead and remove it from the wearsleeve.



5.The control tube assembly can now be removed from the backhead



6.The checkvalve spring can now be removed should it be necessary, although generally this will not be needed.



7.The guide bush can be removed by tilting the wearsleeve downwards and shaking. If this proved difficult , the guide bush can be pushed out.

8.Tilting the hammer upside will allow the piston to be removed, taking care to catch the piston as it falls out.

9.Unless there is damage to the piston retaining ring, there should be no need to remove it. However if this should need replacing , dropping an inverted piston down the upright wearsleeve from the backhead end should remove it.

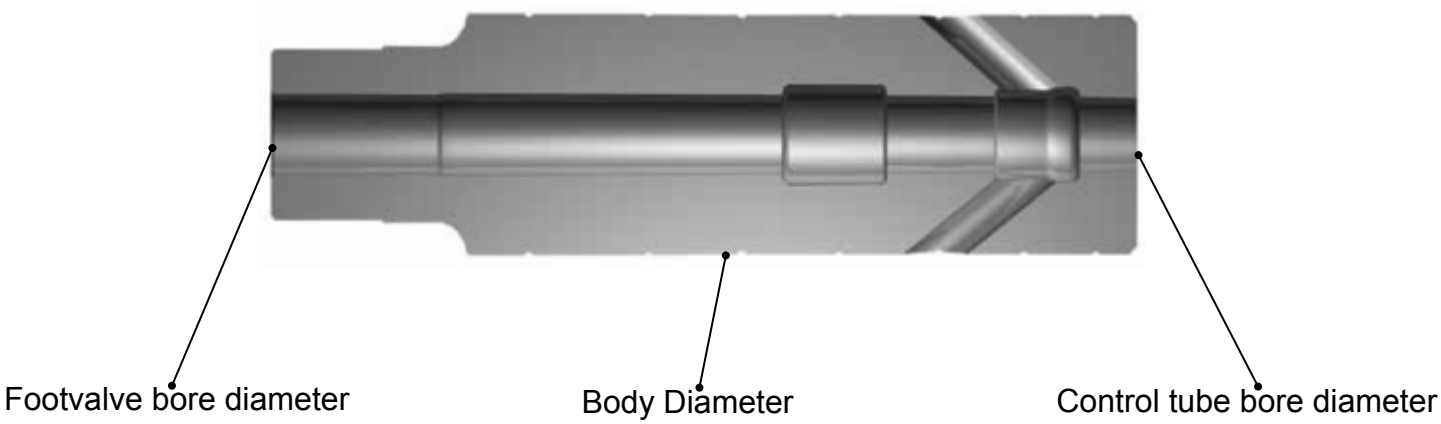
8 CHECKING FOR WEAR & DAMAGE

Premature wear to internal parts is a result of either:-

1. Insufficient or incorrect lubrication.
2. The ingress of debris into the hammer.
3. Incorrect service and storage.

The maximum wear allowance shown in this section are a guide as to when to replace parts. In certain conditions parts may need to be replaced before they reach the sizes shown.

Piston



Max Footvalve bore	1.525”	38.73mm
Max Control tube bore	1.610”	40.89mm
Min Body diameter	4.577”	116.26mm

There are two main areas to examine on a used piston:-

1. Check the body diameter for signs of pickup and burning (both are signs of poor lubrication). Using a micrometer, measure the diameter and refer to the quoted minimum size above.

   Any light ‘Pick up’ marks can be removed using emery cloth, however if there are signs of overheating and cracking, the piston should be replaced and the lubrication system examined.

2. Secondly, using a micrometer, measure the diameter of the bore at both ends of the piston and refer to the maximum quoted sizes.

3. Examine the striking face. Some degree of distortion is acceptable proving there are no signs of cracking. If distortion has affected the chamfer and possibly distorted the footvalve bore diameter, this needs to be reformed on a lathe and footvalve bore re-ground to its original diameter.Burrs and dents can be removed with an emery stone.

Maintaining the piston face

Fig.1 New Piston Face

Fig. 2 Worn Piston Face

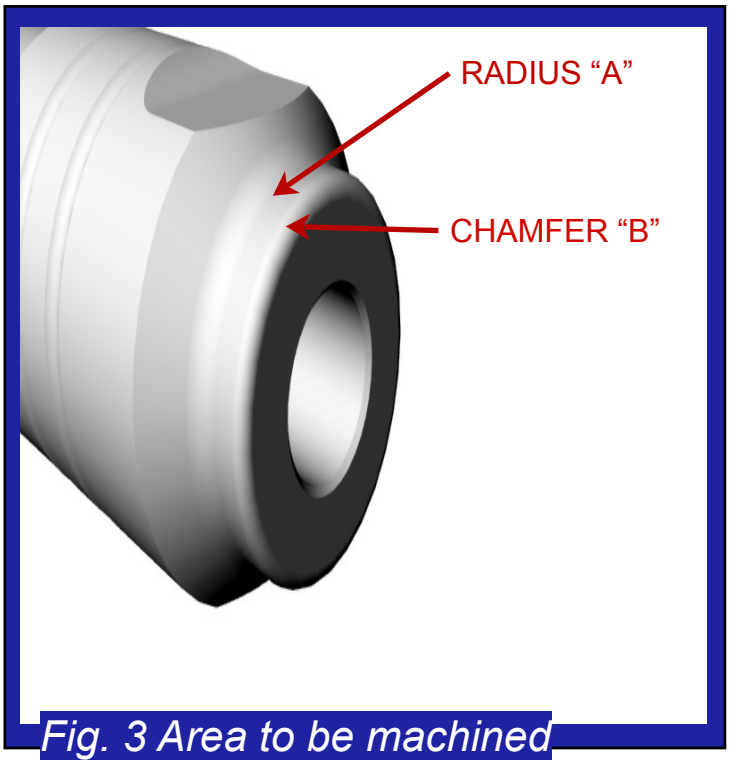


Fig. 3 Area to be machined

During the working life of the hammer the Striking Face on the Piston may become dented or deformed *(see fig.2)*. To prevent this face from cracking, or chipping, the Piston should be returned to a lathe where the strking face can be re-machined flat and then have the outer radius and inner chamfer reformed *(see fig.3)*..

Care should be taken to remove the minimum amout of material during this re-machining process and at no point should more than 2mm be removed from the face. **Pistons with wear patterns, or indentations deeper than 2mm should be replaced.**

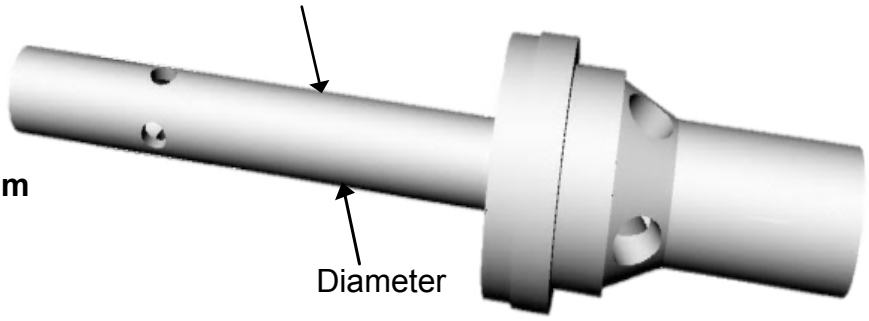
The table below contains useful machine information for reforming the piston face.

MACHINE DETAIL		
HAMMER	**RADIUS “A”**	**CHAMFER “B”**
HYPER 66DH	0.250”	0.125” @45

9 CHECKING FOR WEAR & DAMAGE

Control Tube

Note - Control Tube minimum diameter 1.595” (40.51mm)



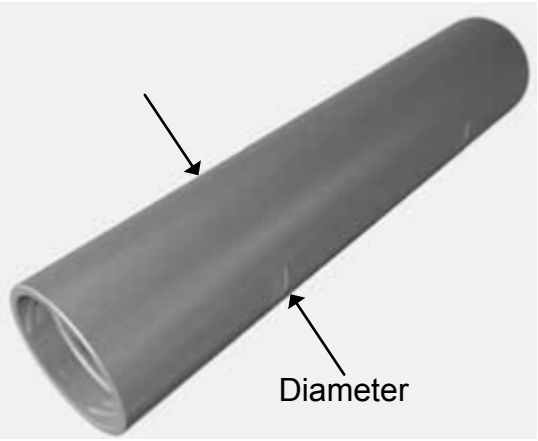
Examine the control tube diameter using a micrometer. Check the diameter has not worn under the specified minimum. If there are signs of pickup they should be removed by using emery cloth.

Wearsleeve

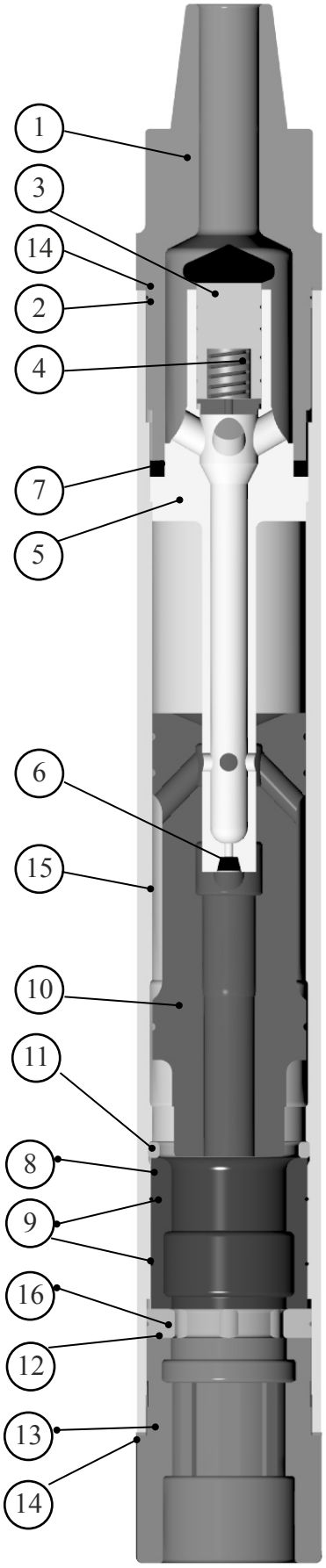
Using either a micrometer or vernier, measure the outer diameter of the Wearsleeve. If it is below the minimum it must be replaced. The wear rate of the Wearsleeve can be slowed by replacing the Chuck before the wear area reaches the Wearsleeve.

The bore of the Wearsleeve should be periodically checked for any signs of ‘Pick up’. If a piston has broken within the wearsleeve it is imperative that the bore is honed to remove any burrs or ‘pick-up’.

Failure to do so will result in ‘pick-up’ on the replaced piston and will lead to early failure of this component.



Note - Wearsleeve minimum diameter 5.25” (133.35mm)



1. Ensure all the maintenance work outlined in the previous section has been completed.

2. Stand the wearsleeve(15) on the floor, with the Chuck end upwards. Insert the piston retaining ring(11) into the bore and hammer the ring down until it springs into the groove in the Wearsleeve.

3. Clamp the wearsleeve horizontally in a vice, taking care not to over tighten the jaws. First fit the bit bush (8) with new "O" rings then push into the wearsleeve. Assemble the chuck(13), breakout washer(14) and bit retaining rings(12) (ensure to fit a new 'O' ring) around the button bit. Cover the threads with a copper based grease. Hand tighten the chuck assembly into the wearsleeve.

4. Coat the Piston(10) with Rock Drill oil and slide it into the Backhead(1) end of the Wearsleeve. *Ensure the Piston striking face enters first.*

5. Slide the Control Tube into the Wearsleeve.

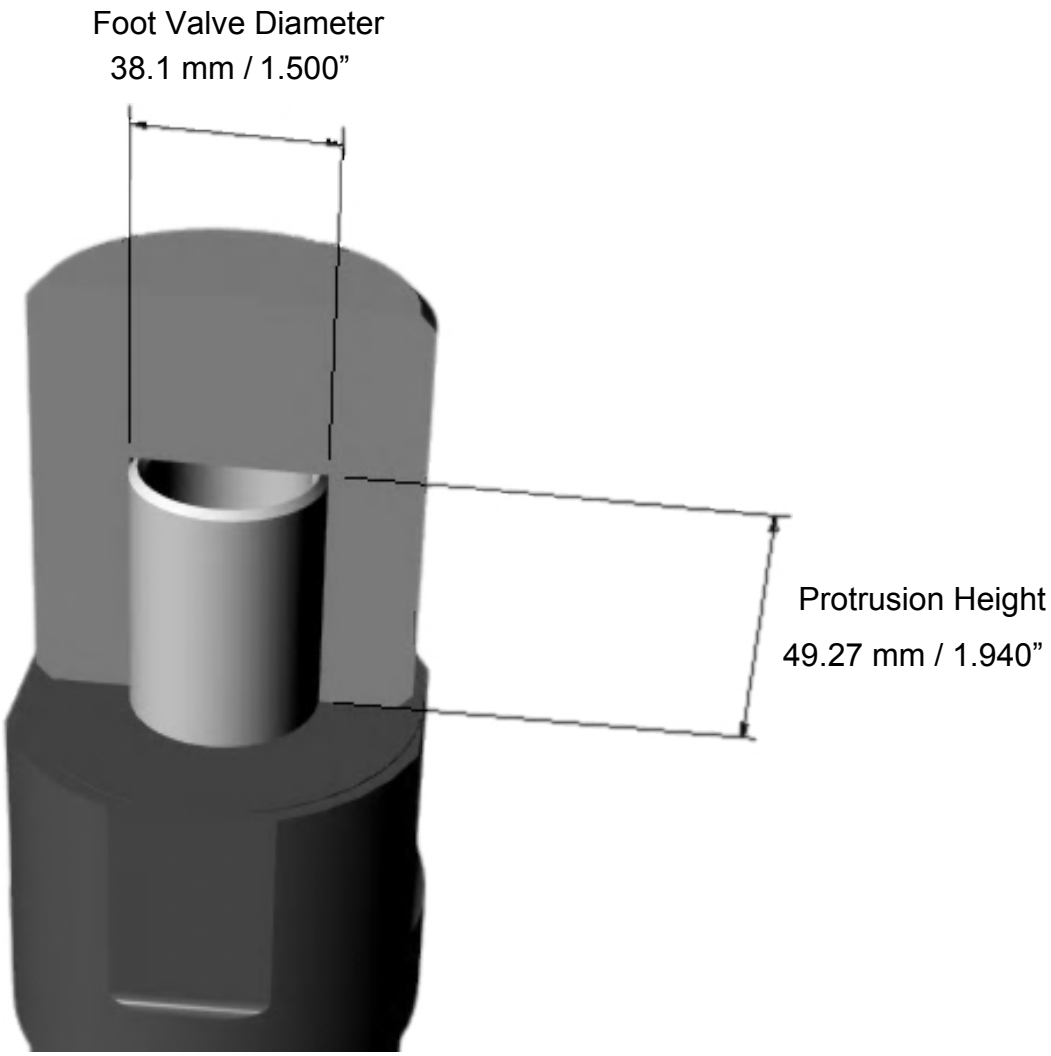
6. Insert the Spring(4) into the Check Valve(3) and then slide the assembly into the Control Tube.

7. Cover the threads of the backhead with a copper based grease and insert it into the backhead end of the wearsleeve(15) by hand tightening.

8. Should the backhead be removed, the wearsleeve should not be inverted past the horizontal position, unless it is necessary to remove the piston.

Note: Ensure both the backhead and chuck are fully torqued up prior to commencing drilling.

11 BUTTON BIT FOOT VALVE



The Bulroc Hyper 66 DHD 360 hammer is designed to be used with foot valves.

The correct foot valve must be fitted otherwise the performance of the hammer will be seriously affected.

Using a foot valve which is larger in diameter than the specified will result in the rapid failure of the foot valve.

Using a foot valve which is smaller in diameter than the size specified will greatly reduce the performance of the hammer.

The protrusion height is also important and to ensure the correct height and prevent damage when replacing the foot valve, it is recommended the correct insertion tool is used:

Bulroc Part Ref: BBFVIT093

LUBRICATION 12

The Hyper 66DH piston oscillates at 930 bpm at 150 psi (10bar). It is therefore extremely important that an adequate supply of the correct type of rock drill oil is constantly fed to the hammer whilst it is operating.

Failure to do so will quickly lead to excessive component wear and if the oil supply is cut off for any reason, the piston will quickly seize inside the wearsleeve, resulting in irrepairable damage to both components.

An air line lubrication system should be installed, preferably on the drill rig. The lubricator reservoir should be of sufficient capacity to supply the required volume of rock drill oil for a full shift. It is equally important that the lubricator system must be adjustable and have a visual check to ensure the lubricator does not run out of oil.

As a good general guide, all Bulroc hammers require a third of a pint of oil per 100 cfm of air through the hammer (0.07 litre per meter cubed).

Eg : Hyper 66DH operating at 150 psi = 296 cfm = 1 pint per hour.
10.3 bar = 8.4 M^3 = 0.56 litre per hour.

The amount of lubrication oil should be increased by 50% when drilling with water or foam. When new drill pipes are added to the drill string, it is recommended that a half pint (quarter of a litre) of rock drill oil is poured into the pipe to provide a good internal coating and helps prevent the hammer from running dry at any time. The grade of rock drill oil will be determined by the ambient temperature at the drilling site. If the ambient temperature is between 0 and 25 degrees centigrade, then a 30 grade oil should be used. If the ambient temperature is greater than 250 degrees centigrade, then use a 50 grade oil. Bulroc supply their own recommended rock drill oil. See below for all the recommended brands of oils.

MAKE	TYPE 30 GRADE	TYPE 50 GRADE
BULROC	T220	T320
BP	ENERGOL RD-E 100	ENERGOL RD-E 300
CHEVRON	ARIES 100	ARIES 320
SHELL	TORCULA 100	TORCULA 320
ESSO/EXXON	AROX EP100	AROX EP320

13 STORAGE PROCEDURES

We recommend following the points listed below when removing a 'Down the Hole' hammer from service. This will ensure trouble free operation once the hammer starts work again.

The hammer should be stripped and cleaned and freed of as much water/moisture as possible. Bulroc 320 or similar rock drill oil should be poured into the backhead, allowing all parts to be coated throughout the hammer. The check valve should be depressed to help the ingress of oil.

Amount required ¾ of a pint or 0.43 litre.

Both ends of the hammer should then be covered to prevent the ingress of dirt etc.

It should be laid horizontally in a dry environment ready for use next time.

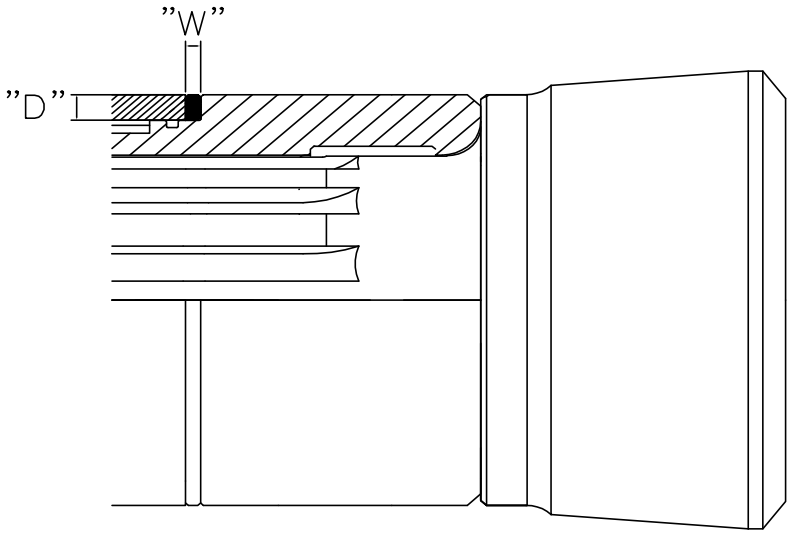
If this procedure is followed then apart from protecting the hammer from corrosion it will protect the parts from premature wear and of course reduce 'down time' and eventual repair costs.

However we strongly recommend that the hammer, especially if stored for any long period of time, should be stripped, cleaned, inspected and re-oiled prior to use, to be sure of smooth drilling.

14 TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
INOPERATIVE DRILL	Drill bit blowholes blocked	Unblock holes
	Dirt inside drill	Strip and clean drill
	Worn or damaged parts	Replace damaged parts
	Insufficient lubrication	Check oil level, adjust lube needle value
	Excessive lubrication	Adjust lube needle value
	Hanging Piston	Pistion stuck. Polish out the score marks
	Insufficient air pressure	Check compressor discharge and increase to operational value
SLOW PENETRATION	Insufficient air pressure	Increase discharge pressure
	Dull drill bit	Re-grind or change bit
	Worn drill parts	Replace worn parts
	Too much or too little lubrication	Check oil level and if necessary adjust lube needle value
	Dirt in drill	Strip and clean
LOW RETURN AIR VELOCITY	Insufficient hole flushing air passing through hammer	Drill or increase hole size through the piston
	Drill bit exhaust holes blocked	Clean out blockage
SPASMODIC OPERATION	Failed or damaged parts	Overhaul drill
	Lack of oil	Check lubrication
	Drill bit broken	Replace bit
	Dirt in drill	Strip and clean

A. CHUCK RELEASE WASHERS



CHUCK RELEASE WASHERS		
HAMMER MODEL	"W"	"D"
HYPER 66DH	0.310" - 7.87mm	0.330" - 8.38mm

Chuck Release Washers are fitted to the Bulroc Range of Hyper Hammers to assist the removal of the Chuck from the Wearsleeve after drilling.

The Chuck Release Washer is manufactured from a composite material that reduces the friction between the lock up faces on the Chuck and Wearsleeve making it easier to overcome the tensional loading applied to these parts during the drilling process.

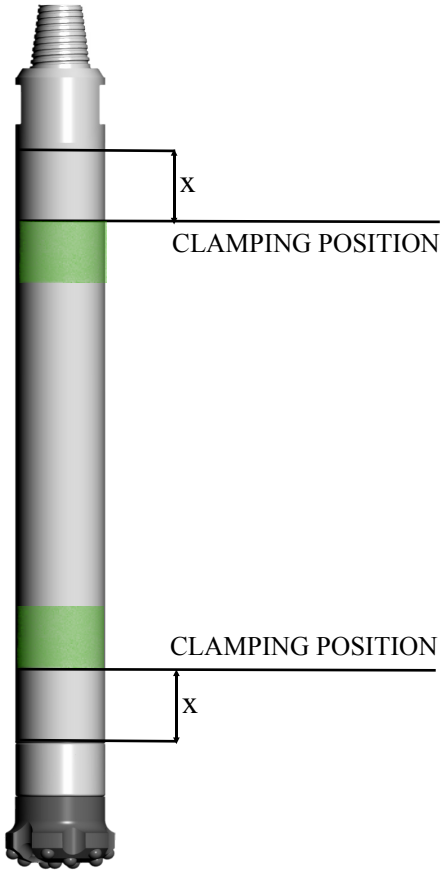
Due to the forces applied to the Chuck Release Washer you may find that its thickness ("W") is reduced during the drilling cycle and it is therefore recommended that a new Washer be fitted each time the Chuck is removed.

It is possible that on some of the larger Hammers in the Bulroc range, when drilling with large diameter Button Bits or Overburden Systems, certain conditions can generate higher torques than normally expected, resulting in difficulties when trying to remove the Chuck from the Wearsleeve. Should this occur then the removal of the Chuck can be achieved by cutting away the Chuck Release Washer. We do however stress at this point that cutting away the Chuck Release Washer is a final option and should not be done until all other options have proved unsuccessful.

If the cutting away of the Chuck Release Washer is necessary for the removal of the Chuck then it must be done with extreme care to avoid damage to either the Chuck or the Wearsleeve. The composition of the Chuck Release Washer allows for it to be cut with either a hacksaw or a small hand grinder equipped with a slitting wheel. The hacksaw method is much safer and less likely to damage the Chuck or Wearsleeve, but obviously much slower than the hand grinder with a slitting wheel. To remove the Chuck Release Washer a cut must be made in the centre of the washer all the way around it's circumference, and completely through the Washer, thus transforming the single washer into two thinner washers that will then spin freely. Great care must be taken, especially if the Washer is cut with a slitting wheel, to ensure that the cut only penetrates the Washer and does not pass through into the body of the Chuck.

The size shown as 'D" in the above table should be your MAXIMUM depth of cut, and it is recommended that either the saw blade or the slitting wheel are marked in some way so as to indicate when they have achieved this depth.

B. CLAMP POSITIONS



CLAMP POSITIONS	
HAMMER MODEL	"X" DISTANCE FROM WEARSLEEVE END FACE
HYPER 66DH	9.000" / 229mm

Always clamp away from threads to avoid damage

There are many different "Splitting" Machines available for unscrewing the threaded connections on a Bulroc Hyper Hammer, some are attachments to the Drill Rig, others are independent hydraulic units, or purpose made Bench arrangements. Regardless of which machine is chosen they all require some method of securing the Wearsleeve whilst applying a torque to either the Chuck or Backhead.

The most common machines use either Clamps or Chains around the O/D of the Wearsleeve and the positioning of these is very important, if they are placed too close to the joint being "Split" they will in effect increase the frictional forces on the threaded connection making it impossible to unscrew the component from the Wearsleeve.

The above table shows the correct position for the clamping mechanism to ensure no additional load will be applied to the threaded connection, thus making the joint easier to split.

Due to the high torque loads applied to a Hammer during its drilling cycle, equally high loads are required to "Split" the Chuck and Backhead away from the Wearsleeve and because of this the clamping arrangement around the Wearsleeve must generate enough friction to prevent it from spinning during the process. However, great care must be taken to make sure the clamps or chains are not over-tightened as this can cause deformation to the Wearsleeve that can result in both Wearsleeve failure and Piston seizure once the Hammer is returned to service.

To help increase the Wearsleeve's resistance to deformation it is recommended that the Hammer Piston is first slid to the end of the Hammer being "split", before clamps of chains are attached. By doing this the Piston O/D will limit the amount of deformation in the Wearsleeve bore if too much clamping pressure is applied.

NOTE:

The use of Chain type Hydraulic Breakers can leave deep intrusions in the O/D of the Wearsleeve which may result in stress concentrations that could lead to premature failure of the Wearsleeve.

Your Bulroc Hyper 66DH Hammer has been proudly
manufactured in Great Britain

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